tmacog 208

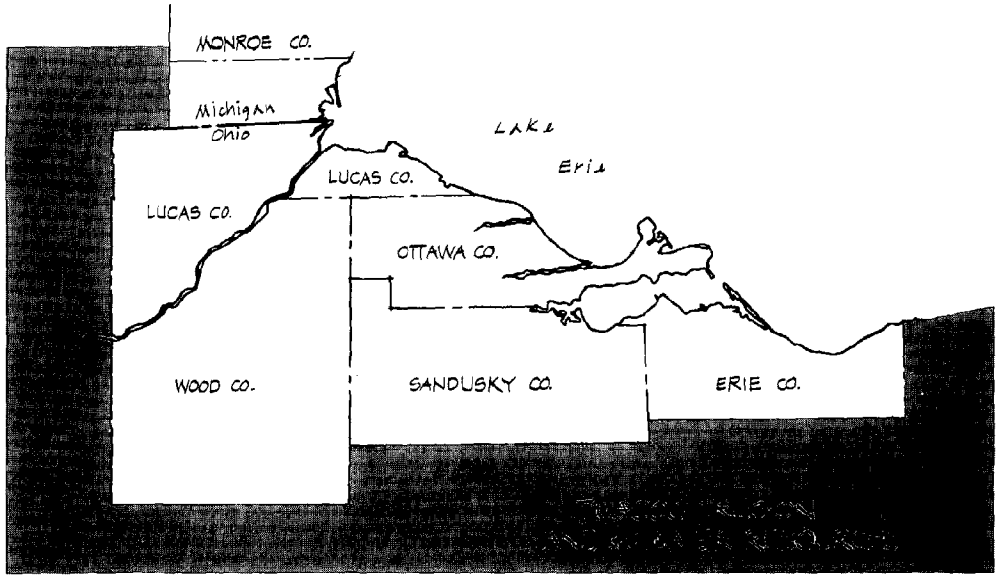
a discussion of approaches to solving water quality problems

BOOK 2

about tmacog and the tmacog region

The Toledo Metropolitan Area Council of Governments (TMACOG - pronounced "Team-a-cog") is a voluntary association of local governments working together to solve common problems. Counties, cities, villages, and townships, as well as various special purpose units of government such as school districts, are all charged with meeting certain responsibilities in serving their citizens. In many cases, the problems encountered by local governments in meeting these responsibilities have sources and impacts well beyond the boundaries of individual local communities. Urban growth, air and water quality problems, energy shortages, and inadequate public roads and other facilities have all stimulated an increased interest in regional cooperation. Similarly, the proliferation of state and federal programs to assist or encourage local governments in solving these problems has created a need for a firmer grasp of solutions to area-wide problems and the financial means of attaining those solutions. TMACOG therefore endeavors to strengthen the capabilities of local governments by approaching problems which cannot be solved by individual local units of government.

The TMACOG region's boundaries were set by two separate executive orders of the Governor of Ohio in order to qualify Ohio communities for federal and state grants. TMACOG is the Regional Planning and Development Organization (RPDO) for this part of Ohio. The governing body of TMACOG is its General Assembly, made up of elected officials from each of its member units of government. The on-going business of TMACOG is conducted by an executive committee elected from members of the General Assembly.



The TMACOG Region:

6 counties
15 cities
46 villages
69 townships
in 2 states

preface

This book is about water quality in the TMACOG region. It has been prepared to provide you with some information about water and water quality and to stimulate your thoughts about how we can solve water quality problems.

We invite your participation in a planning program being conducted by TMACOG to recommend actions to control water pollution in this region.

The planning program that is presently underway is formally called the Areawide Waste Treatment Management Planning Study. It is part of a national program to clean up the nation's waters by 1985. The law which mandates this clean-up is the Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500. The part of the law that provides for area-wide planning for this region and others like it where water quality control has become a major problem is Section 208. There are several unique features of "208 planning":

- **Local initiative – The planning is carried out by a local agency, not a federal or state agency.**
- **Citizen participation – Involvement of the public at large is required by the law.**
- **Implementation – The plan must designate an agency or agencies responsible for implementation of the plan to assure water quality standards are in fact achieved.**
- **Emphasis on innovation – The plan must be cost effective; all practical alternatives to meeting water quality standards must be examined (both those that involve construction and those that involve new legal or management arrangements).**
- **Comprehensive analysis – *All* sources of water pollution must be examined (point sources as well as area sources).**

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update

current program status

This series of books is designed to serve as an on-going guide to a water quality planning study being conducted by the Toledo Metropolitan Area Council of Governments (TMACOG). The objective of the study is to develop a plan to show how the region can meet water quality goals established by Congress in 1972.

This book is the second of a series that will be prepared. Each book is published at a point in the planning process where input from the public is particularly important. The program has been in progress for more than a year. It is now at the point of having defined the major problems to be considered and is beginning to develop approaches to solving those problems.

Input from citizens and concerned elected and administrative officials throughout the region has already been valuable in helping TMACOG progress with its work thus far. Let us review briefly the previous work of the program and examine the results of the first phase of the public participation process that is integral to this study.

Book 1: The Issues and Implications of Water Quality Management was about water quality in the TMACOG region. It was prepared to provide citizens with some information about water and water quality and to stimulate thinking about how we all affect the quality of water in our everyday lives. *Book 1* also described several water quality problems that face us all. The book noted that solutions to water quality problems often involve increased water and land management by government. The solution to one set of problems must not create a new set of problems. A balance between interests of the public, private enterprise, and government must be maintained as we work together to solve environmental problems common to us all.

TMACOG held its first series of public forums in August, 1975. The forums were designed to provide an opportunity for citizens to meet with leaders from their immediate communities and discuss the issues introduced in *Book 1.*

TMACOG's goal in sponsoring the forums was twofold: to stimulate community interaction and response to various issues, and to obtain citizen input to its program. An opinion survey aimed at identifying the attitudes of the participants and others in the region relative to these issues followed the forums.

First forums were held in the following locations:

Huron	August 5
Toledo	August 7
Port Clinton	August 12

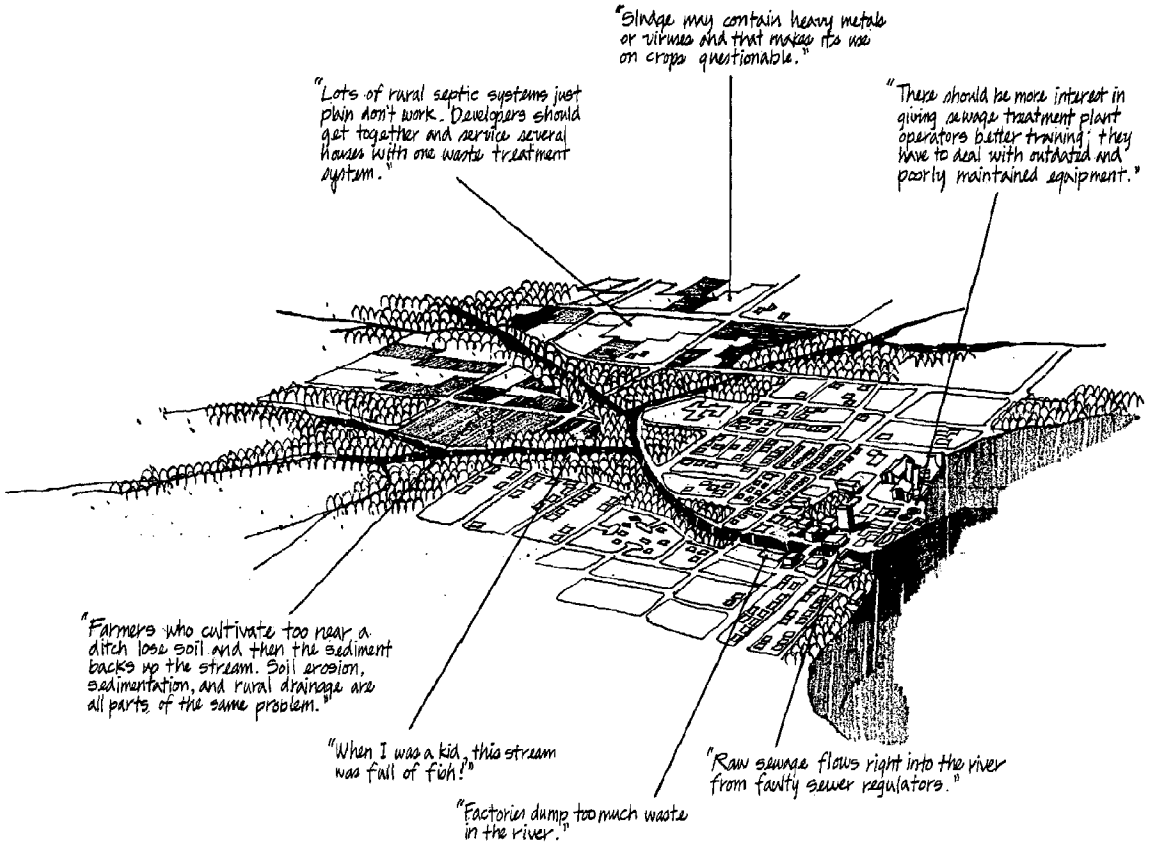
The program format consisted of an introductory presentation on water quality problems, a group session to identify some different aspects of the problems, and small group discussions of specific problem areas relevant to the interests of individual participants.

The Issues - A Discussion

Problem areas identified in *Book 1* were waste water treatment plant performance, disposal of sewage sludge, industrial discharges, combined storm and sanitary sewer systems, soil erosion and sedimentation, and urban and rural drainage. Forum participants were asked to evaluate the problem areas and indicate the relative importance of each. In general, all the problems were of some concern.

Persons attending the Huron forum felt that the problems of soil erosion and sedimentation, and urban and rural drainage were of equal importance and should be combined into one category as the most important problem. At the Toledo forum the problems of combined storm and sanitary sewer overflows, and industrial waste discharges were considered most significant. Urban and rural drainage, soil erosion and sedimentation, and industrial waste discharges were all considered to be very important issues at the Port Clinton forum.

One noteworthy conclusion that can be drawn from the group discussions is that public awareness of water quality issues stems from the results of water quality problems rather than their causes. The illustration on the right indicates the kind of comments that were typically made at the forums about water quality problems. The problems were generally expressed in terms of visibly lost amenities or benefits.



"WHAT PEOPLE SAY ABOUT POLLUTION"

Survey Results

An opinion survey was designed as a follow-up to *Book 1* and the first forums. The survey sought the attitudes of 2,000 elected officials, citizens, and administrative officials in the region about water quaity problems. The large number of returned questionaires suggests an unusually high degree of interest in water quality problems in the region.

Respondents found discharge of industrial wastes and inadequate sewage treatment facilities to be top priority problems in the region. There was also considerable concern over soil erosion and sludge disposal. Only about one-fifth of the respondents saw inadequate federal and state laws and regulations as an obstacle to solving water quality problems. Dollar cost to taxpayers was seen as the most important obstacle to solving water quality problems.

When asked about the basis for their concerns about water quality problems, protection of the environment, unsuitability of water for desired uses, and protection of family health were felt to be the most important. Effects on property values and "cost to me as a taxpayer" were viewed as considerably less important.

In identifying general solutions to water quality problems, respondents most frequently indicated "more local regulation of land uses affecting water quality" and "more local regulation of growth and development" as appropriate approaches. Fewer than five percent of the respondents indicated they would accept less stringent standards for water quality. Also, relatively little interest was expressed in more federal regulations, increased local water and sewer rates, or higher consumer costs.

A Redefinition of the Problem Areas

A result of the forums has been a redefinition of the problem areas. An area of concern cited at all three forums was on-site sewage disposal in areas not served by public sewers. This was seen as a problem area that included impacts on water quality due to septic tank installation and maintenance as well as proliferation of small "package" sewage treatment plants. Additionally, participants felt that waste water treatment problems could be more easily discussed in terms of performance of existing facilities and planning for future facilities. It was not clear what was meant by "urban and rural drainage" as a problem area. Thus, along with soil erosion and sedimentation, it has been redefined into an urban problem (urban runoff and construction site erosion) and a rural problem (rural soil erosion and land runoff).

The problem areas:

- **Performance of waste water treatment systems**
- **Planning for waste water treatment systems**
- **Sludge disposal**
- **Industrial waste discharges**
- **Combined sewer overflows**
- **On-site sewage disposal**
- **Urban runoff and construction site erosion**
- **Rural soil erosion and land runoff**

Conclusion

The forum participants would like to see improved performance in many areas; for example, better use and enforcement of existing legislation, better administration by government officials, both local and state, and better operation of sewage treatment plants.

Although the participants felt that there is room for much improvement within the existing system, they also called for new or expanded means of control such as soil erosion control laws, stricter zoning, more limitation and regulation of industrial wastes, and building prohibitions where the land capability is unsuitable for development.

The survey results generally were consistent with the views expressed at the forums. There was support for action to solve water quality problems, and respondents expressed high expectations about the role the TMACOG 208 Study can play in solving these problems.

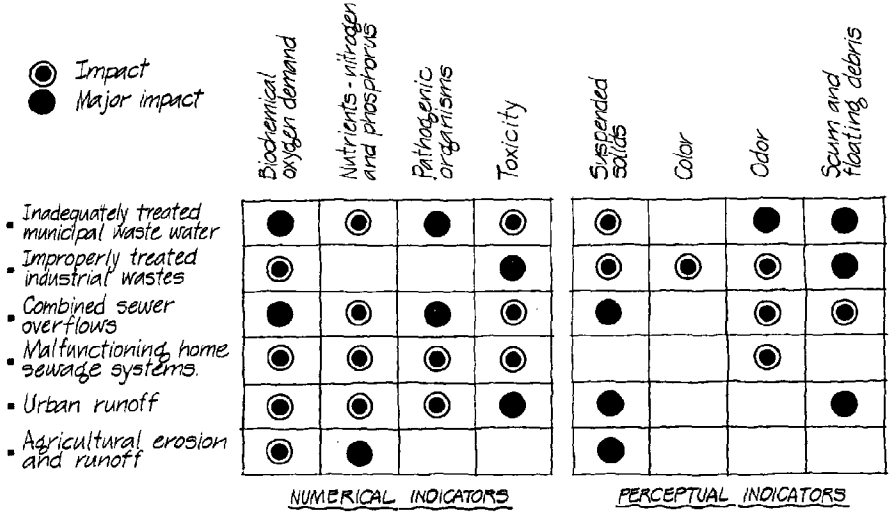
Survey respondents and forum participants alike recognized the need to educate the public about the nature and severity of water quality problems. Some people felt that TMACOG's role should be that of an informational, educational agency. There appears to be a consensus that the public generally does not understand and would perhaps not accept the pollution abatement measures which the TMACOG 208 Program may eventually recommend. Political realities demand a broad base of public support and very active citizen involvement before any pollution control and land use regulatory measures will become effective.

environmental perspective

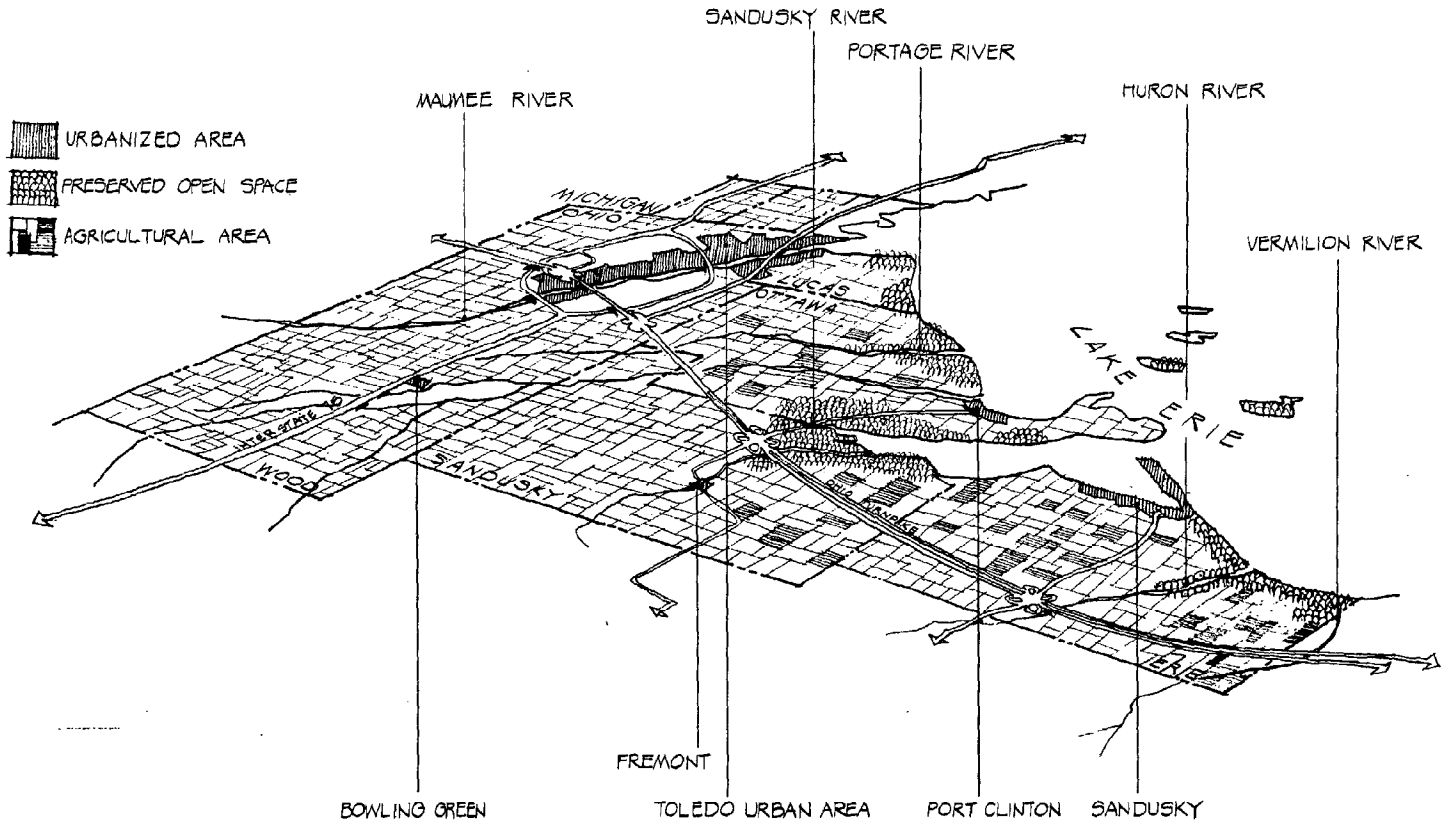
The ultimate goal of TMACOG's 208 Program is to achieve clean waters in the region by 1983 and to maintain those clean waters through a system of coordinated regional policies and controls. The United States Environmental Protection Agency defines clean waters as those which are "fishable and swimmable" or which support normal healthy aquatic life and are safe for human body contact.

Good quality natural waters are characterized by balanced ecological systems. When we treat our water resources carelessly we disrupt these systems. There are many ways to measure water quality. Some common "numerical" indicators of water quality are dissolved oxygen, biochemical oxygen demand (BOD), nutrient levels (nitrogen and phosphorus), and presence of pathogenic organisms (fecal coliform is an *indicator* of this). Evaluation of these indicators requires special equipment and highly trained personnel. Often water that is polluted because of high levels of these indictors may not appear to be unsafe. Other indicators of water quality are related to things we can see. These "perceptual" indicators are sometimes less precise, but at the same time they may be more understandable to the average citizen.

The basic "fishable and swimmable" water quality standard implies that numerical as well as perceptual indicators will be brought to acceptable levels, since all water that looks good isn't necessarily safe, and all water that is safe doesn't necessarily look good. The following table demonstrates the relationship between the two types of indicators and the impact different kinds of pollution have upon them.



GENERAL IMPACT OF THE PROBLEMS ON WATER QUALITY



the tmacog region

The TMACOG region contains five major river systems: the Maumee, the Portage, the Sandusky, the Huron, and the Vermilion. In addition, there are five creekshed areas containing the Ottawa River and several small streams that drain directly to Lake Erie.

A major portion of the Maumee and Portage river systems is within what was once known as the Black Swamp, an extremely flat, poorly drained area with rich black soils and dense forest. The clearing and draining of the Black Swamp for agricultural production beginning in the early 1900's resulted in a general drop in the water table and increased sediment loads in the rivers and streams. Many of the region's water quality problems today can be traced to this extensive alteration of the environment to make the land economically suitable for farming. The inlands of the region, with the exception of the urban areas of Bowling Green and Fremont, remain today in predominantly agricultural use.

The Lake Erie shorelands contain a variety of land uses. The urbanized areas of Toledo, Sandusky, Huron, and Vermilion contain approximately 60 percent of the TMACOG region's population. There are extensive areas of preserved marshland and open space, particularly in Ottawa County, consisting of private, as well as federal and state, wildlife refuges. Areas around Port Clinton and the Lake Erie islands are an international tourist attraction, seasonally drawing large numbers of people for water-oriented recreation.

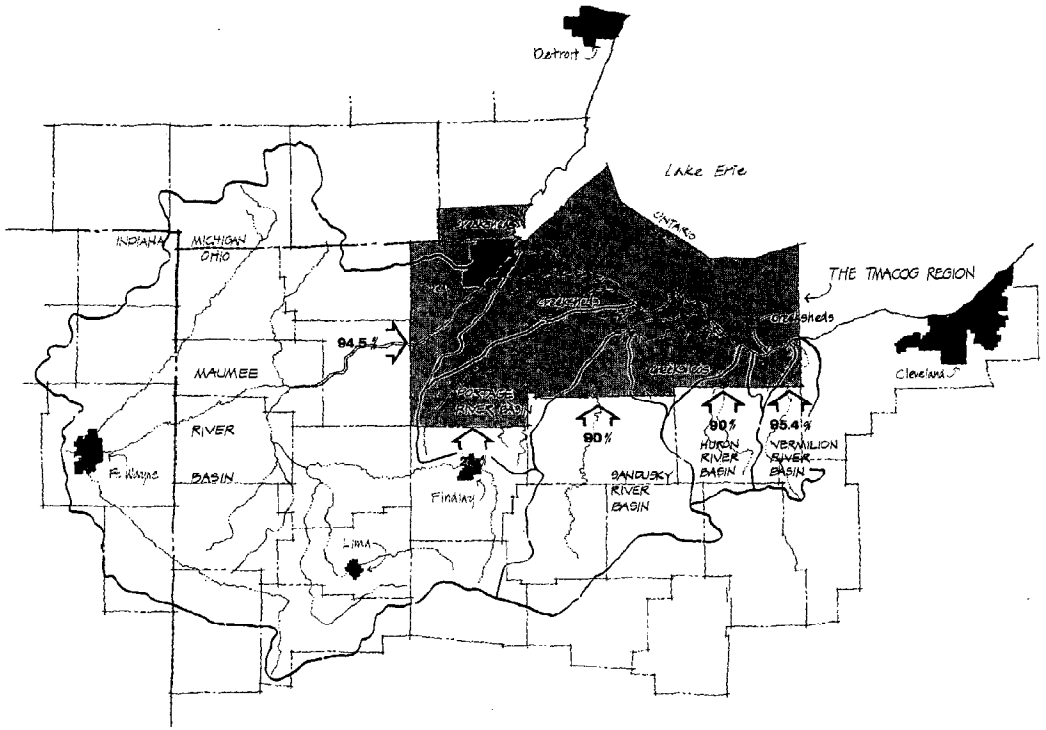
factors affecting the region's water quality

The character and quality of the water flowing in the rivers of the five major basins are substantially affected by factors outside the political boundaries of the communities that comprise the TMACOG region.

Upstream Heritage

The headwaters of all the major river systems occur south and west of the region. In total, the TMACOG region contains only the downstream 20 percent of the drainage area of these rivers. Only the lowest 5 percent of the Maumee River watershed, which reaches as far west as Indiana, is within the TMACOG region. The Portage River Basin, though considerably smaller, is 76 percent within the TMACOG region. We call the pollution loadings that come from upstream sources our "upstream heritage."

These pollution loadings are largely the result of rural and urban land uses similar to those which occur within the TMACOG region and which contribute to water quality problems within our area. The solution to water quality problems within our area will, therefore, have to be carefully coordinated with similar water pollution control programs in upstream areas. A major responsibility for such programs lies with the State of Ohio Environmental Protection Agency. The water quality goals established by Congress apply everywhere; the TMACOG region has the advantage of 100% federal funding assistance and a localized agency to undertake the planning work.



"UPSTREAM HERITAGE"

Lake Erie Water Quality

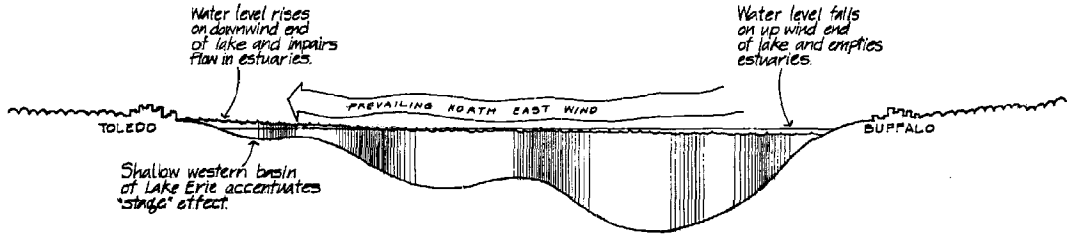
The "upstream heritage" also affects the water quality of Lake Erie. Recent studies suggest that lake water quality is improving. In the last decade many point sources of pollution (municipal sewage treatment plants and industrial discharges) have been cleaned up. However, true improvements can be established only after measurements have been taken over a period of time. Record high lake levels of the last few years may have affected temperature and dissolved oxygen levels such that the improvements are only "apparent."

Perhaps more significant is the work currently underway at the Buffalo Corps of Engineers in connection with its *Lake Erie Wastewater Management Study.*[1] Preliminary conclusions in that study are that previous estimates of pollutant loads in the lake were "far too low." They have found that pollutant loads in streams which flow into the lake are significantly higher during periods of increased flow. Since point source pollution is relatively constant regardless of stream flow, this indicates that non-point sources of pollution such as soil erosion and agricultural runoff are major factors in lake water quality.

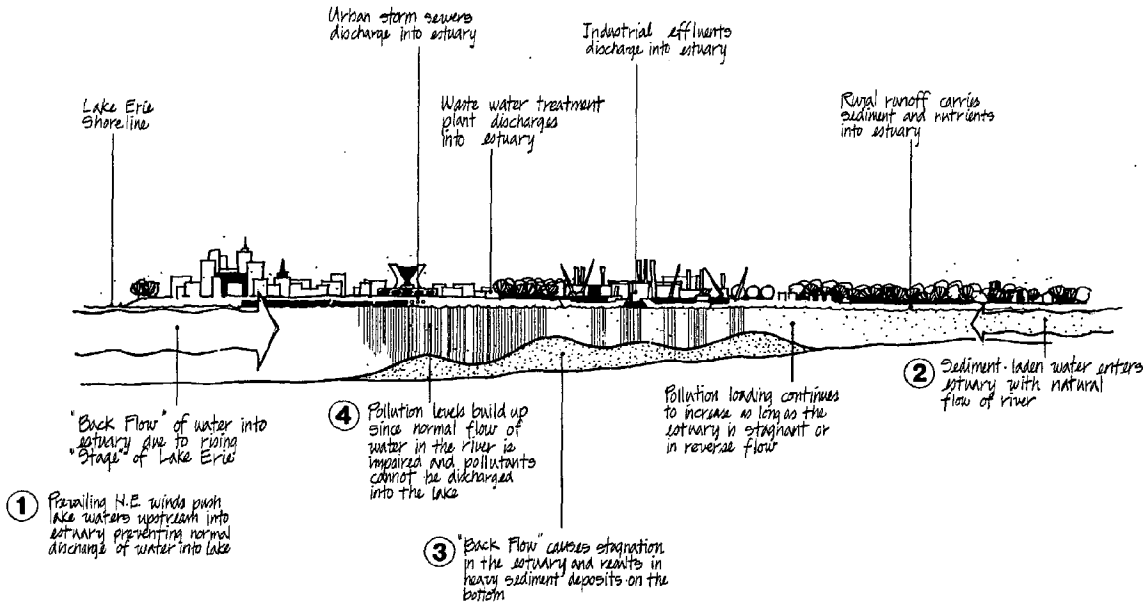
Estuary Water Quality

An unpredictable natural occurrence that affects the rivers of the region is the "stage" of Lake Erie, or the rise and fall of its water level. The area at the mouth of a river where its waters mix with waters of the receiving body of water (Lake Erie in this case) is called the estuary. Estuaries of the rivers in this region vary in length depending upon the flatness or gradient of the river and the width of the channel. The Maumee River estuary is more than 14 miles long, while the Vermilion River estuary is less than two miles long. The flow of water in the estuaries is controlled by the level of western Lake Erie and the direction, velocity, and duration of the winds.

When the winds blow steadily out of the southwest, water in the lake is displaced from the western to the eastern end and the lake level near Toledo falls. Water thus runs out of the estuary in a "flushing" action. When the winds blow steadily out of the northeast, water is shifted to the western end of the lake and the lake level near Toledo rises. As water enters the estuary, the river, in effect, flows upstream. At some times the estuaries are either stagnant or in reverse flow. When this occurs, there is a build-up of wastes since they cannot be carried out of the estuary. Sedimentation also increases when the rate of flow is reduced.



LAKE ERIE "STAGE" EFFECT

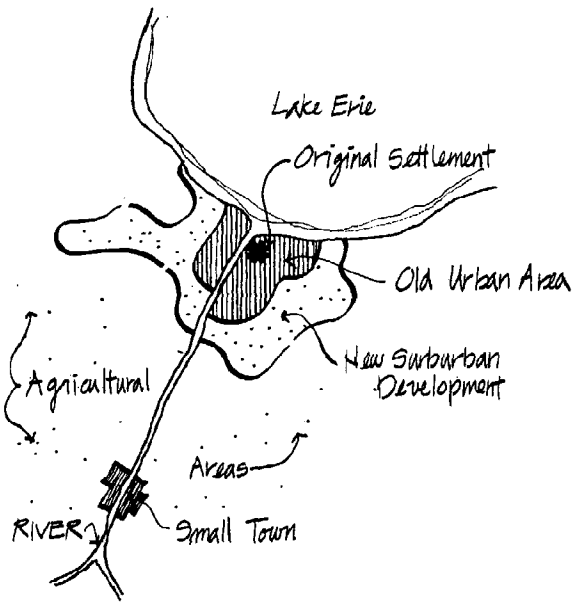


ESTUARY "BACK FLOW" ACTION

the influence of water on development

Historically, estuaries of major rivers have been subject to heavy development pressures because of the need for water to serve transportation, commerce, and industry. In the TMACOG region, initial settlements occurred near the mouths of the rivers because they provided sheltered ports with good accessibility to Lake Erie. Soon industry became a primary land use along the rivers. Industry provided jobs resulting in a rapid population growth and a demand for housing, commercial, business, and educational services. A typical American urban pattern emerged. In the last 25 years, the all too common suburban sprawl pattern of growth appeared around the original compact and efficient urban core.

Small towns developed mainly as service centers for agricultural activities. They were often located on rivers or their major tributaries because they depended on the river as a water supply and an energy source to power mills. Because of their agricultural orientation, the small towns have not been subjected to the growth pressures of the larger urban areas, and have retained their basic size, pattern, and character.

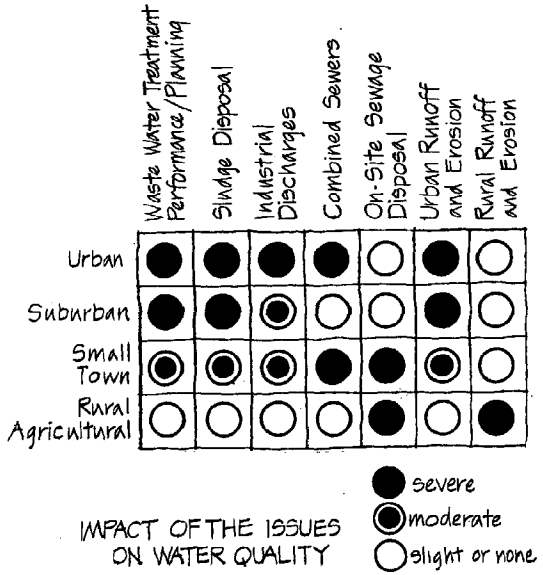


the influence of development on water

The accelerated growth associated with industrialization of the TMACOG region led to the degradation of water quality in urban areas. Management of water in the cities involved large capital expenditures and produced predominantly point source discharges. Sanitary sewers were installed to pipe sewage to central treatment plants and storm sewers were installed to collect rainfall runoff. Present water quality problems are in part a result of inadequate capacity of these systems caused by growth and their obsolescence relative to today's water quality standards.

In the rural areas growth has not been as rapid or concentrated and the land continues to be used primarily for agricultural purposes. The management of water is an individual responsibility with each resident having control of his own water supply, sewage disposal, and management of his property.

In rural areas water quality problems such as land runoff and contamination of ground and surface water by leaching from septic tanks are basically due to poor land management practices.



IMPACT OF THE ISSUES ON WATER QUALITY

Photo Courtesy of Art Weber, Metropolitan Park District, Toledo

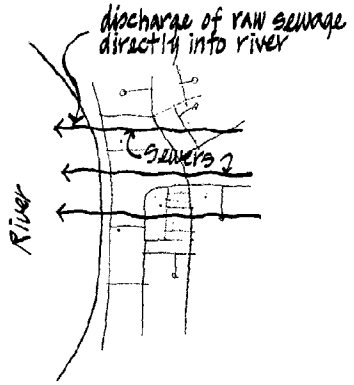
the problem areas

a brief history of waste water management

A study of the history of waste water management reveals a general change in the function that sewer systems have been asked to perform. Our initial concern of carrying wastes away from people to prevent disease has evolved into a major concern for responsible management of the environment and all its related systems. This change can be characterized by the following stages. The dates to which these stages correspond vary widely across the nation. The dates shown here generally indicate when each stage occurred in the TMACOG region.

Stage I - Removal of Waste from the Doorstep

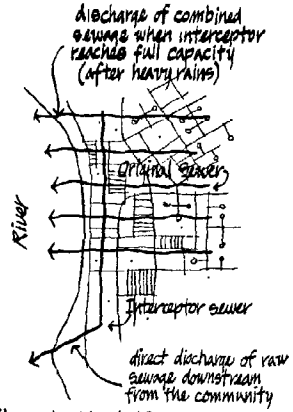
In the 19th Century cities constructed culverts or sewers for storm water drainage. These sewers also provided a handy means for the disposal of household wastes as cesspools were gradually tied into the system. The primary function of the system was to collect water and wastes and transport them away from the doorsteps of houses and stores to be discharged into an adjacent stream or river.



Stage I · Before 1900

Stage II - Community-wide Waste Removal

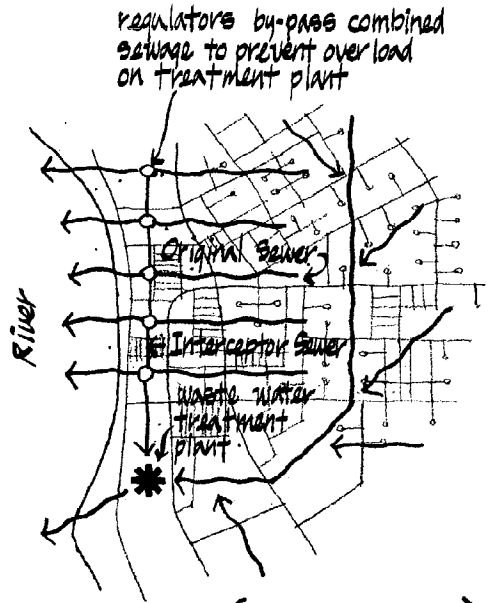
As population increased, the wastes discharged by the sewers became a community health hazard. The primary concern then became the need to transport the wastes away from the community's doorstep. Interceptor sewers were built to collect sewer discharges and transport them downstream to a point safely remote from the community.



Stage II · About 1910-1925

Stage III - Early Waste Treatment

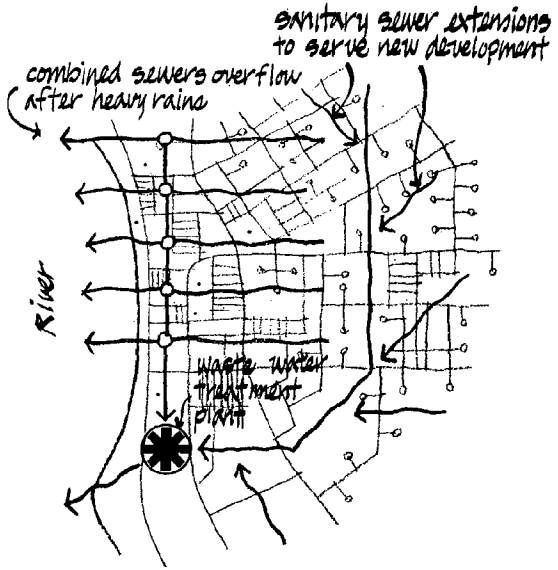
The continued growth of many communities in close proximity to one another and an increased rate water consumption resulted in waste discharges that severely degraded water quality. In many cases the water being drawn from a stream to supply one community was polluted by the wastes of an upstream community. The primary concern was still basically a need to avoid health hazards but with particular concern for nuisances caused to other communities. Some basic sewage treatment was ordered by the State. In most cases the intial installations provided primary treatment which removed approximately 40 to 60 percent of the solids from the waste water.



Stage III · 1925-1935 (Primary Treatment)

Stage IV - Waste Management by Standards

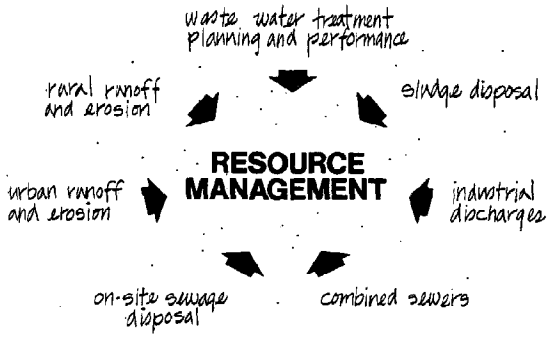
Primary treatment was not sufficient to effectively solve all the problems, particularly in areas where concentrated populations produced large volumes of sewage. Secondary treatment technology, which removes at least 80 percent of the organic matter from the waste water, was applied. Final disinfection of the effluent is now a part of the process. Advanced treatment for removal of phophorus has also become a requirement. The concern at this stage involves recognition of the need to meet certain minimum standards to protect water quality.



Stage IV · 1955-1970 (Secondary Treatment)

Stage V - Comprehensive Environmental Management

An awareness of the limits of our environment has brought about the need to view waste treatment in the context of resources management. The resources management concept recognizes that all human activity uses resources and then returns them to the environment in an altered state. Sound resources management for water quality means that careful consideration should be given to the impact of returning resources to the environment. Thus, waste water treatment objectives are now defined in relationship to objectives and programs for solving other water pollution problems such as combined sewer overflows, storm water runoff, soil erosion, and industrial waste discharges.



Stage V-1972-___
Improved Environmental Quality Through Resource Management

performance of waste water treatment systems

Our needs in waste water treatment have shifted from waste disposal to resource management. Understanding this transformation can help us to focus on two major factors relevant to the performance of waste water treatment systems. First, performance of our plants is being measured against current standards and goals that exceed those acceptable at the time of original construction. Second, operation and maintenance of modern treatment systems must be based on a management philosophy of cost effective environmental protection. Performance of waste water treatment systems is not simply a matter of obsolete equipment or someone not doing his or her job.

Obsolete Equipment?

There is no one to blame for treatment facilities that do not meet current water quality standards. When these facilities were designed, it was never anticipated that they would have to perform to these levels. Too frequently, however, we want to solve problems with more sophisticated technology or expanded facilities when equal benefits could be achieved through increased management efficiency. Increased management efficiency in this context means assuring maximum economics for optimum service, interaction of parts of the system, and flexibility in utilization of personnel and equipment.

Someone Not Doing the Job?

Plant personnel, like all of us, need recognition for the work they perform. Community support and work incentives can make a valuable contribution to professional pride among plant personnel. Lack of a skilled manpower base cannot be solved by a single community. Yet all the communities of the region would be benefited by a cooperative program to foster the professional image of waste treatment plant personnel through regional training, operator and staff exchanges, or other programs.

Application of modern business management principles to plant operations could also improve performance. Regional billing, laboratory testing, or administrative services, for example, could be valuable for many communities. Many small businesses subscribe to centralized billing services offered through major bank credit cards. This adds to the conveniences they can offer without detracting from their own autonomy.

Performance and Water Use

We should also seriously consider whether we really need to be as consumptive of water to maintain our life-style as we have been. Conservation of water has a twofold saving aside from the obvious value of assuring the availability of water. The cost of procurement and preparation of water for excess use and the cost of collection and treatment of that water as waste are both reduced.

Possible Solutions:

- Develop a region-wide **training and exchange program** for waste treatment plant personnel. **(A)**
- Develop a program to increase **community recognition** of plant personnel professionalism. **(E)**
- Utilize regional or inter-agency **billing or administration services. (A)**
- Establish cooperative arrangements for **shared laboratory facilities** and surveillance responsibilities to minimize the expense of duplication of personnel and equipment. **(A)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

planning for waste water treatment systems

Waste treatment systems (sewers and treatment plants) are important to us for three major reasons:

1. They carry away and treat the collective wastes of the community, thus making an urban economy possible.
2. They have a major impact on the natural environment since the wastes are not always treated to the level necessary to avoid water quality degradation.
3. They have a major impact in the fiscal solvency of the community. Sewers and treatment plants are expensive and require long-term commitments of community tax revenues.

Planning for waste treatment systems must be carried out as part of a larger planning process, where knowledge of engineering and the structure and finance of government must be blended with an understanding of the social and economic motivations of people. Planning for sewer services is too complex to be considered only an exercise in technology. Reliable and consistent information about population and economic trends, as well as community goals and methods of achieving those goals, must all be integrated into the planning process.

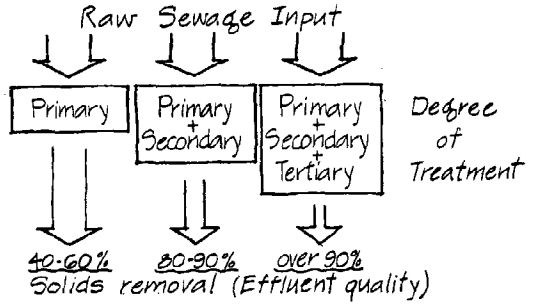
Communities have been "planning" waste treatment facilities for years. Yet it is clear from a quick look at the disorder and inefficiency of our urban areas that better planning and implementation of plans could be achieved. Though most everyone would agree that "good planning" is desirable, there seems to be considerable difficulty in actually bringing it about. "Good planning" involves developing a set of logical criteria consistent with the community's goals for the future, and evaluating proposed actions that will affect the future of the community in terms of those criteria. Planning decisions should be made in an open forum where all interests can express their concerns.

Why is good planning so difficult to achieve? One major factor is that planning creates a situation where government receives the authority to make decisions that previously seemed to have been left to fate. Most people would rather have "fate" deny them the right to carry out a desired project than an agency of government that is susceptible to human judgement and political pressure.

Another important factor in explaining the resistance to planning lies with the incentives built into our existing system. Some private interest groups and public officials are in a position to profit greatly, even though to the average citizen the decisions appear to be left to fate. The existing system places certain public officials in positions of potentially tremendous power, since their decisions may confer great rewards on selected individuals or interest groups. Two advantages of an open planning system are:

- *Private developers cannot profit from* prior inside knowledge about where and when future public improvements such as sewer and water service will be provided.
- Construction firms that receive contracts for millions of dollars in public works projects such as roads, sewage treatment facilities, and storm and sanitary sewer lines cannot influence decisions to their advantage.

Open planning need not, and probably could not, radically alter existing lines of authority. By bringing more interests into the decision-making process, however, it



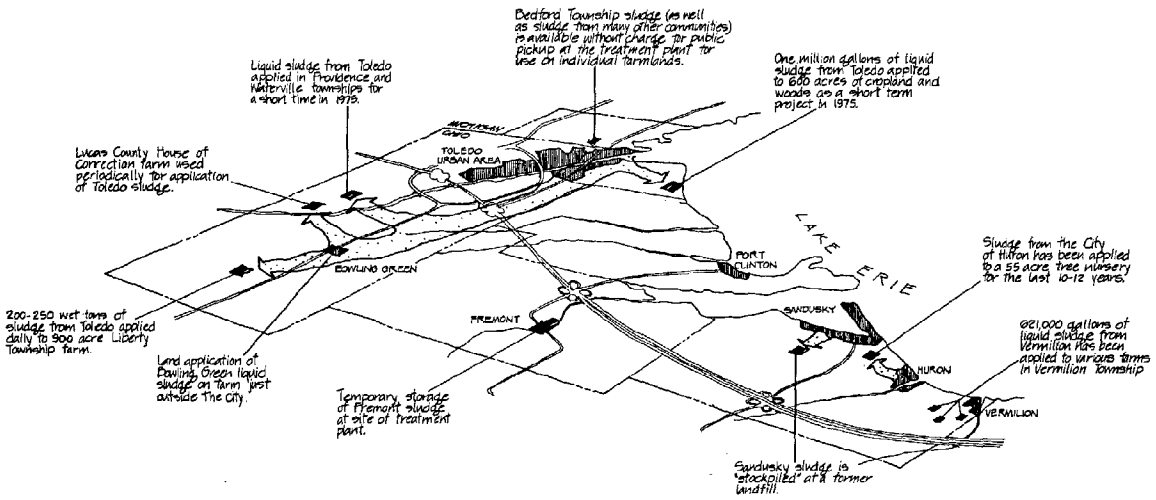
RELATIONSHIP OF TREATMENT TO SOLIDS REMOVED

is possible to better insure that tax dollars for sewer and water, or any other services, are spent for the betterment of the whole community. In an open planning system, citizen interests would play a larger role in decision making. A recent survey of citizen opinion in the TMACOG region indicated that more than 70 percent of the respondents felt that the citizen should have a larger role in the decisions of government beyond that which they can exercise at the ballot box.[2] This kind of participation is essential to bring about good planning.

Possible Solutions:

- Establish a formal county- or region-wide **planning coordination system** to insure waste treatment planning is consistent with other planning. **(A)**
- Develop a **standardized information** base (population and economic projections, land use data) for use throughout the region. Planning for waste treatment facilities, solid waste, or transportation would then all be based on consistent data. **(A)**
- Adopt a **phased growth** control system where approval of new developments is specifically tied to a community public improvements plan for new or expanded schools, sewers, roads, and drainage works. **(L)**
- Amend local ordinances to reflect a **land capability** approach to approvals for new development, based on performance standards. In certain sensitive areas such as wetlands or flood plains, sewer extension would be prohibited. **(L)**

Note: See page 26 for a discussion of the code letters following each suggested solution.



SLUDGE DISPOSAL IN THE TMACOG REGION - 1975 'An ever changing picture'

DYNAMICS OF SLUDGE

(In Toledo, 100 million gallons of sewage produces 250,000 gallons of sludge before sludge treatment.)

Process	% Solids	Physical Appearance	Handling Technique
Before digestion after secondary clarification	4 to 5%	Thin liquid	Can be pumped
After primary digestion	8%	Thick liquid (gravy)	
After dewatering	15%	Paste	
After vacuum filtration	22%	Plastic clay (filter cake)	
After drying on fields	100%	Fine dust	Must be shoveled

Source: Adapted from J. W. Wyatt, *Planning and Technical Considerations for Ultimate Disposal of Residual Wastes* (Washington, D.C.: United States Environmental Protection Agency, August, 1974).

sludge disposal

Sludge has always been a product of the waste water treatment process. The increasing concern over sewage sludge is due to two factors. First, more sludge is being produced. Higher quality effluent necessarily results in greater quantities of waste removed from the sewage. Second, standards for sludge disposal practices that would minimize adverse impacts on air quality, groundwater, and soil are lacking.

The type of waste water treatment processes utilized and the effectiveness of a plant's operation determine the amount of sludge that is generated. According to the Environmental Protection Agency, "implementation of secondary and tertiary treatment requirements will result in dramatic increases in sludge quantities in the next ten years."[3] The Toledo waste water treatment plant currently spends approximately $2 million per year, or about 40 percent of its budget, for sludge processing and disposal.

The city of Toledo, while attempting to solve its own sludge disposal problem, has undertaken three pilot projects which utilize the nutrient value of the sludge. The oldest and the largest operation is a project where approximately 250 dry tons of sludge are being applied daily to an 886-acre farm in southern Wood County. Sludge is hauled by truck in solid form (see illustration) and then spread on cropland. An impervious pad with an isolated drainage system allows storage of sludge on days when weather conditions prevent application.

Sludge in a solid state is difficult to apply evenly and is messy to transfer from one vehicle to another. A pilot project in Jerusalem Township, east of Toledo, was initiated to determine how much liquid sludge could be handled in a daily operation without the need for extensive on-site storage. Fifty thousand gallons of liquid sludge were sprayed daily. The farm was entirely diked such that all runoff had to be pumped from the site. This provided the added opportunity to measure the impact of sludge application on water quality

from both direct overland runoff and from farm tile drainage. Liquid sludge is easier to handle since it can be pumped from truck to truck and sprayed fairly evenly onto fields where it can rapidly dry and become totally odorless. Although less costly to process, since no dewatering is necessary, liquid sludge costs more to transport.

The third project was conducted in conjunction with the Whitehouse Agricultural Seed and Supply Company. The concept of the operation was that sludge could be used as a basic fertilizer if the specialized needs of each farmer could be met by mixing sludge with selected chemical fertilizers as needed.

Several other commuinities in the region have been applying sludge to farmland for a number of years (see the illustration on page 14). Additionally, many farmers throughout the region have been applying sludge to their own lands through special arrangements with small treatment plants.

Rural residents who are not served by sewers must be aware that sludge disposal is not just a "city problem." Most septic tank sludge is hauled to waste water treatment plants. In Wood and Ottawa counties, septic tank sludge may be applied directly to the land through closely regulated County Health Department programs.

Controls

The Ohio Environmental Protection Agency (OEPA) will evaluate sites for the suitability of land application of sludge. However, OEPA can only make recommendations; no specific regulations or legislation govern spray irrigation or land application. There is great reliance on the sense of responsibility in the ad hoc arrangements between municipal waste water treatment plant operators and farmers.

Advantages and Disadvantages of Land Application

The major advantage of land application is that it effectively utilizes a waste product as a soil conditioner or fertilizer. There are three major disadvantages: odor, potential pollution of ground and surface water, and limitation of crops that can be grown. Soils, water table, climate, and operation and maintenance of the site all must be considered in the evaluation of potential ground and surface water pollution. Odor is known to be a problem, especially under certain weather conditions. The presence of heavy metals and pathogenic organisms in sludge may result in reduced crop yields or render some crops unfit for human consumption.

Sanitary Landfill

Sanitary landfills, another possible method of sludge disposal, are available in close proximity to most populated areas. A possible advantage of this approach is that the high paper content of municipal wastes may absorb some of the moisture in the sludge. A major disadvantage, especially in the TMACOG region, is the potential for pollution of ground waters. Also, the difficulty of adapting equipment and operators to the handling of sludge may be a problem.

Incineration

A third method of sludge disposal is incineration. The high moisture content of sludge requires auxiliary fuel for the incineration process. For incineration to be cost effective, these fuels must be readily available at low prices. In addition, the incineration process may transfer the pollution burden to the air.

Possible Solutions:

- Combine sludge with combustible solid wastes and use as an **energy source. (A)**
- **Apply to farmland** as a soil conditioner. Establish an independent control agency to monitor heavy metal content and arbitrate complaints. **(A)**
- **Custom blend** sludge with chemical fertilizers to bring nutrient contents to desired levels for specific crop production. (This service could be offered through a private business.) **(A)**
- Establish a region-wide **sludge broker** that could bring farmers and sludge producers together and assist in negotiating contacts. **(A)**
- **Process and export** sludge for use in reclamation of strip-minded land or as a construction material for street surfaces, parking lots, road foundations, or fill. **(A)**
- **Establish sludge disposal** districts for controlled application in specially designated areas. **(A)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

industrial discharges

A favored location for many industries has been one with direct access to a natural waterway to insure an adequate supply of water for processing, and to allow easy disposal of industrial wastes. For many years, industries discharged untreated industrial wastes into streams and rivers. At first the effect on water quality was of little consequence because wastes were quickly diluted. With the gradual realization that our streams, rivers, and lakes are polluted, a major portion of the blame has been directed toward industry. There is a good deal of public feeling that since industries are motivated by profit they are not concerned with controlling discharges if it means any added cost. But traditionally, we have not provided industry the incentive to reflect environmental costs in its products.

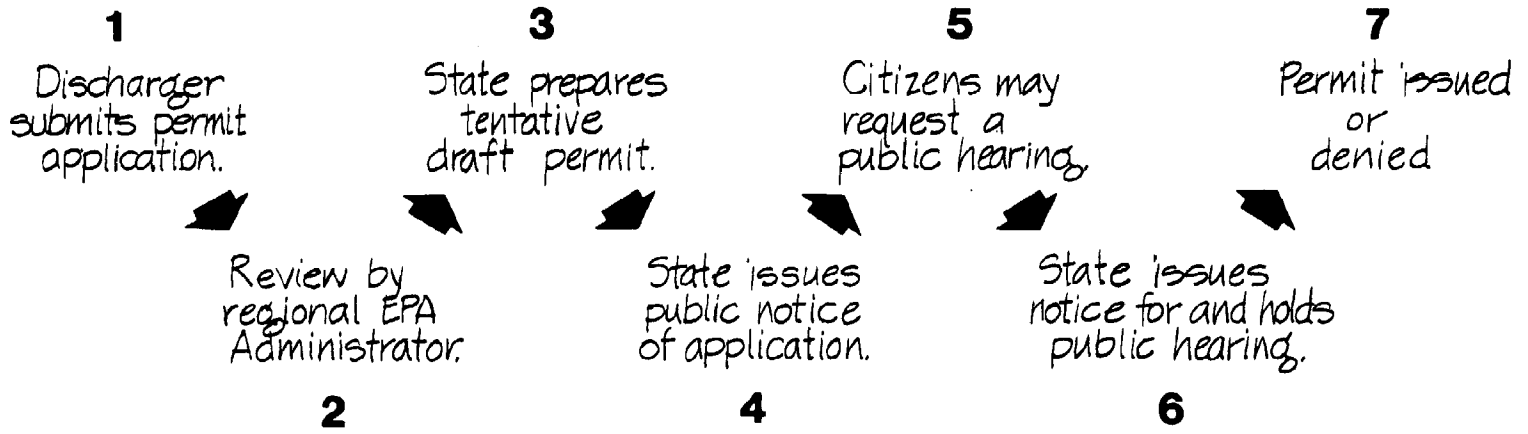
Industrial pollution can be identified, monitored, and controlled in a systematic manner. Accordingly, new federal effluent standards have been developed featuring a two-level program requiring industries to reduce discharges over a period of time to meet the 1983 "clean water" deadline. But the new rules and regulations should do more than simply force industry to clean up its waste and pass the bill along to consumers. When confronted with new effluent standards, industry engineers often rethink their whole process. Frequently, they find better ways to do things that save both energy and materials. Industry can save money while reducing pollutants in two ways: by revamping their processes to require less water or to reuse water, or by extracting valuable materials from the waste for reuse at the plant or for sale to an outside market. This positive approach to industrial pollution problems applies the resources management concept described on page 11.

Generally, industrial effluent is discharged either directly into natural waters or to a municipal waste water treatment plant.

Direct Discharges to Natural Waters

National Pollutant Discharge Elimination System (NPDES) permits are required for discharges of any pollutant. The OEPA has assumed primary responsibility for issuing permits to those dischargers who have not received one, and for enforcing and renewing all effective NPDES permits issued in Ohio. A similar program is conducted by the Department of Natural Resources in Michigan.

An NPDES permit authorizes certain levels of discharge and requires the source owner to monitor and routinely report actual effluent quality. NPDES permits limit the current level of discharge, and in most cases, require the owner to install additional treatment facilities. Where additional treatment facilities are required, a compliance schedule is included setting out the final date on which the treatment facilities must be operational. In these



MAJOR STEPS IN ISSUING AN NPDES PERMIT

situations, a set of final limitations are imposed on effluent quality which are designed to result in the achievement of water quality standards.

Public involvement is a major component of the permit program. When an industry applies for a permit, a proposed NPDES permit and a public notice are prepared. The public notice gives specific information regarding the discharger and the nature of the discharge. For 30 days following the date of public notice, the discharger or any person who may be aggrived or adversely affected by the discharge if the permit were issued, may request a hearing. During the same 30-day period, members of the public may: 1) request copies of the complete proposed permit, 2) comment on the contents of the proposed permit, and 3) request a public meeting (a non-adversary public forum) regarding the permit.[4]

Discharges to Waste Water Treatment Plants

Municipal waste water treatment plants, like industry, must have NPDES permits. Thus, municipalities are concerned about both the volume and character of the effluent they receive from industrial sources. The volume is dependent upon the nature of the manufacturing processes and the number of industrial plants. It is estimated that in some cities in the United States, industrial effluent constitutes over 50 percent of the load on the municipal treatment facilities.[5] The table below indicates the water consumption requirements for various industrial processes and is a rough indicator of the volume of effluent produced.

The character of industrial waste is important in that it may disrupt the operation of waste water treatment plants by damaging equipment or destroying the bacteria required in the treatment process. Public Law 92-500 requires that over a certain time period, all industrial discharges must be pre-treated by the industry to remove wastes which interfere with the treatment process. Industry will not be able to merely transfer its wastes from streams to municipal systems to avoid the necessity of installing pollution abatement equipment and procedures.

Type of Establishment	Gallons of Water	Per Unit
Laundry	5	Pound of wash
Pea canning	25	Case of no. 2 cans
Spinach canning	160	Case of no. 2 cans
Oil refinery	770	Barrel of crude
Paper mill	1,000	Pound of high grade paper
Sugar refinery	125	5-pound bag of sugar
Steel mill	60,000 to 70,000	Ton of steel

Source: Table adapted from Morris P. Cohn, *Sewers for Growing America* (CertainTeed Products Corporation, 1966), p. 82, and William I. Goodman and Eric C. Freund, (eds.), *Principles and Practice of Urban Planning* (Washington, D.C.: International City Managers' Association, 1968), p. 234.

Possible Solutions:

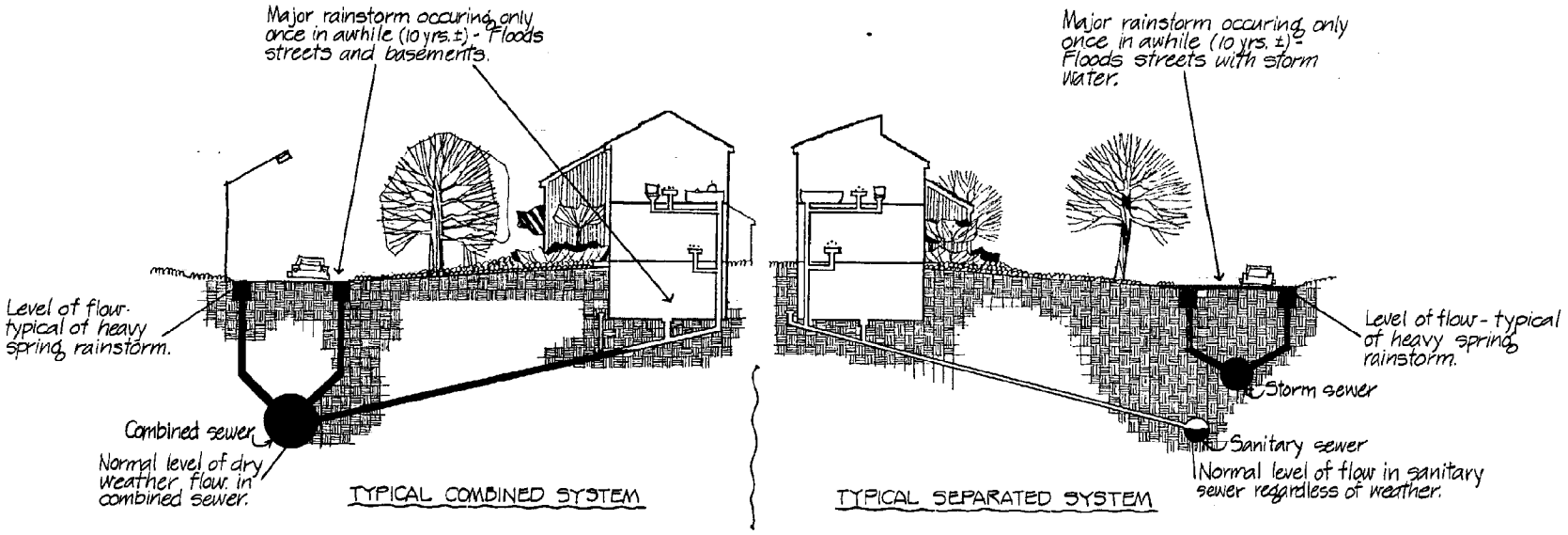
- Establish an education program to **increase citizen awareness** about the NPDES program and provide citizens with special information about effluent quality. **(E)**
- Establish incentives (through taxation or rate structure) to encourage **industry reuse of effluent** of sewage treatment plants or its own processes. **(L)**
- Establish incentives (through rate structures and technical assistance) to encourage innovative **pre-treatment** systems such as vegetative lagoons to assimilate toxic and organic pollutants. **(L)**
- Encourage **reduced water use** by industry through better process management, and improved conservation measures. **(E)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

combined sewer overflows

The discussion of the history of waste water management noted that the purpose of early sewers was to transport both storm waters and household waste waters to the nearest stream or river as quickly and economically as possible. Before the necessity for treatment facilities, there was no reason to separate storm and sanitary sewer flows as we do today, and a single sewer accommodated both. The small amount of diluted sewage which entered steams was dissipated with little adverse effect on the total water quality of the stream. With the passage of time and increased discharges, however, streams, rivers, and lakes became saturated with wastes to the point where they could no longer assimilate raw sewage without serious water quality consequences. New combined sewers have not been constructed for several years, but many communities still have the old combined systems in use. In fact, approximately 40 percent of the national population residing in areas served by sewage systems is served by combined sewers.[6] In the TMACOG region, virtually every community has at least some combined sewers.

In areas where the sewers are connected to a treatment plant, the outflow from the sewer may have been satisfactorily treated under conditions of moderate storm water flow. Population growth subsequent to the construction of the interceptors may have increased sewage volume to the point where overflows may occur even in dry weather. It is economically impractical to build any sanitary sewer system or treatment facility to accommodate the runoff from heavy rainstorms which occur only once in awhile. Still, these storms do occur, and it is then that the combined systems cause serious water pollution problems. All combined systems have regulators which allow high flows of combined sewage to be by-passed directly into a stream or river if the capacity of the interceptor sewer or treatment plant is likely to be exceeded. These regulators function like an automatic valve. Though they are



IMPACT OF RAINFALL ON SEWER CAPACITY

responsible for direct discharge of raw sewage into streams, they do help to prevent back up of sewage into streets and basements due to the inability of the interceptor sewer to handle the increased storm flow. Another problem is that many of the regulators no longer operate properly because of their age and may allow combined sewage to seep into streams during normal dry weather conditions.

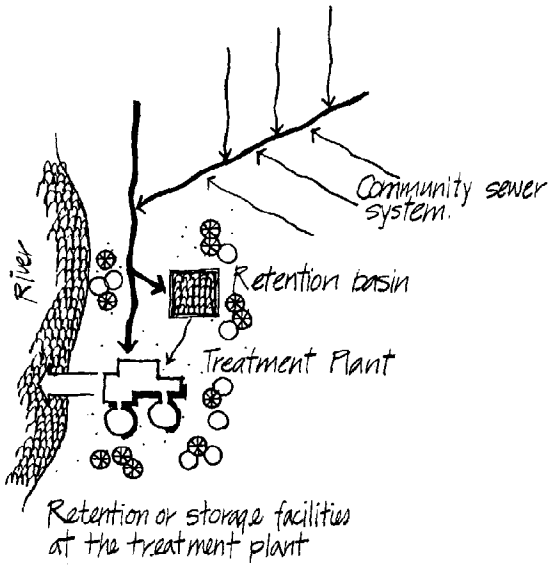
To meet the new water quality standards, the combined systems must either be eliminated or effective treatment of their discharges must be provided. As discussed in *Book 1*, separation of the existing combined sewers into a system to handle only storm water and another to handle sanitary sewage is extremely costly, particularly since most combined systems exist in the more densely developed urban areas. Long-range cost benefits might be gained, however, from the increased capacity of treatment facilities that would result from removing the storm water load for which they were originally designed and built.

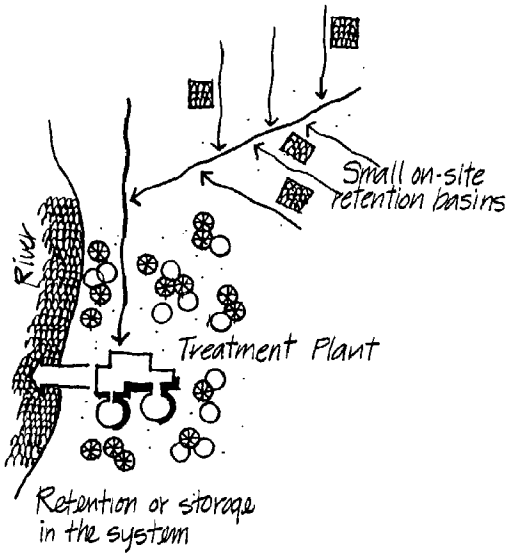
The general alternative of treating the discharges involves either an increase in the treatment plant capacity or construction of storage facilities to collect and hold combined sewer overflows until the storm passes and the sewage can be diverted through the treatment plant.

Storage of the overflows can be accommodated in a large retention area near the treatment plant or in a network of smaller retention facilities located at critical points throughtout the collection system.

In the first case, with a single large retention area, direct discharges to streams could be eliminated, but the pipes that make up the system would still be overburdened in heavy storms. This would continue to result in streets and basements being flooded with combined sewage. In the second case, with a network of smaller retention facilities located throughout that portion of the community served by combined sewers, surface storm water would be collected and held before it could enter the sewer system, eliminating the overloading of the pipes.

Other technological solutions are now being explored that would provide a method of treatment at the combined sewer outfall such as screening, filtering, and disinfecting. In Toledo, and other parts of the region with similar problems, the first objective is to study the weaknesses of the combined sewer systems and to insure proper functioning of the regulators through monitoring and alarm devices.





Possible Solutions:

- Construct **holding ponds** near treatment plants to allow treatment of combined sewage after high flow periods. **(C)**
- Construct **settling basins at storm sewer outfalls** to provide primary treatment of combined sewage flow. **(C)**
- Prevent combined sewer overflows by requiring **on-site retention of storm water** through local ordinances. **(L)**
- Install **"vortex flow" regulators** that would separate 40 to 60 percent of the solid matter from the sewage and channel it to the treatment plants allowing the "cleaner" water to overflow. **(C)**
- Initiate a **phased separation program** for storm and sanitary sewage flows as part of a regular program of rehabilitation or replacement. **(C)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

on-site sewage disposal

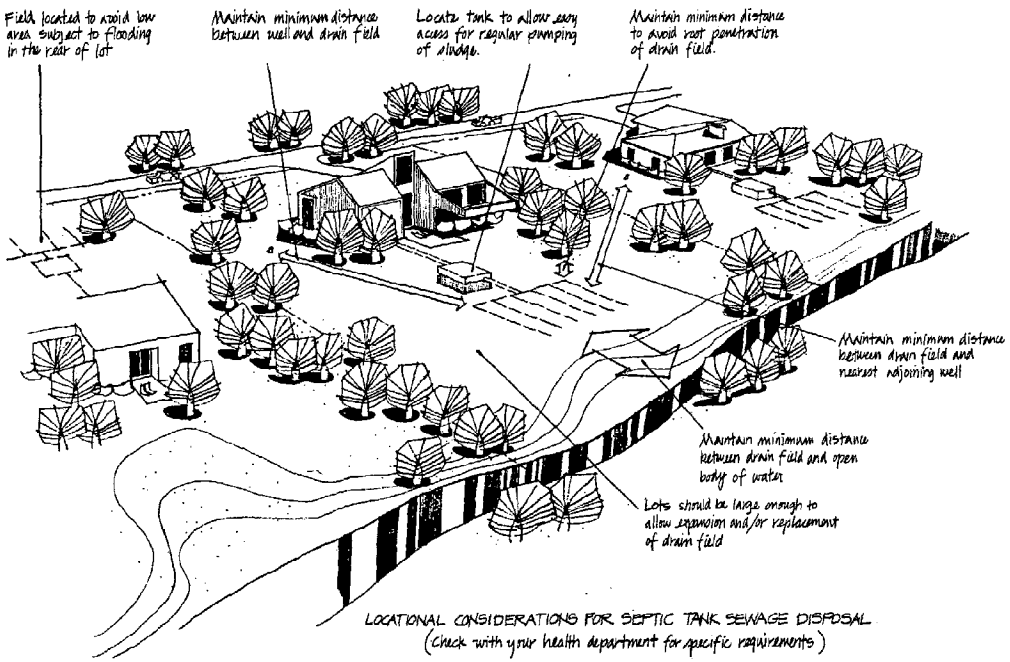
Population movement today tends to be away from the urban areas to the outlying suburbs and rural areas. Frequently, urban services such as water and sewer are not available in these areas. Residents must rely on individual wells and septic tank sewage disposal systems. Approximately 49 million persons are served by 15 million such on-site systems in the United States. One out of every four new homes has an on-site sewage disposal system.[7] The following table illustrates the extent to which these systems are used in the TMACOG region.

Percent of Population Served by On - Site Systems

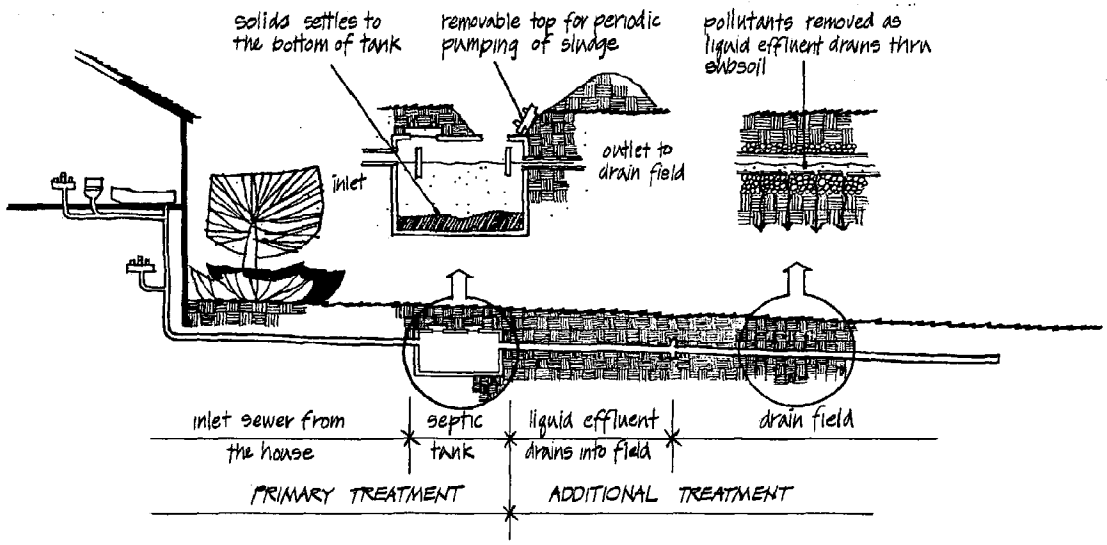
County	
Lucas	8.7%
Wood	64.0%
Ottawa	61.4%
Sandusky	52.2%
Erie	31.9%

Source: Ohio Department of Health.

It is important to bear in mind that septic tank sewage disposal systems are temporary systems with an effective life in the TMACOG region of only about ten to twelve years. Septic tank systems were originally used to meet sewage disposal needs in sparsely populated rural areas when the probability of the area remaining sparsely populated was high. The advent of the post-war housing boom changed that. Sewer construction could not keep pace with the housing demand, and extensive fringe areas were suburbanized using septic tank systems. Septic tanks have become popular alternatives to pub-



LOCATIONAL CONSIDERATIONS FOR SEPTIC TANK SEWAGE DISPOSAL
(check with your health department for specific requirements)

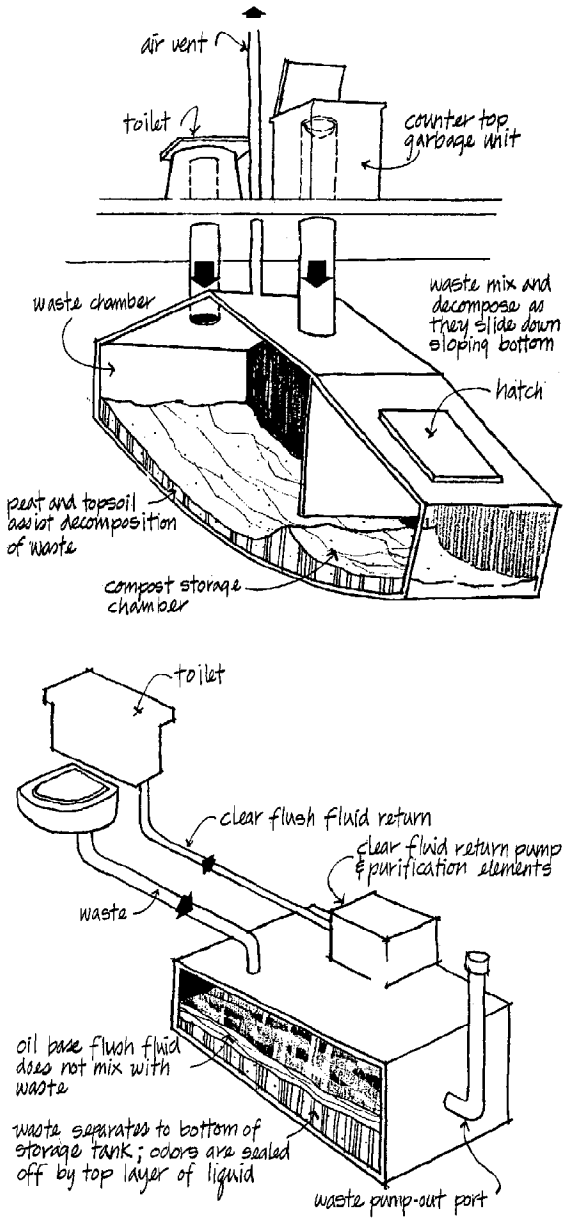


SEPTIC TANK DRAIN FIELD SYSTEM
(how it works)

lic sewer systems despite their short life and sometimes marginal performance. Frequently, sewer services are extended to low-density subdivisions to alleviate pollution resulting from failing septic tank systems. Too often, suburbanites are unaware of the operating principles, limitations, and maintenance requirements of their septic tank systems.

In general, the performance of septic tank systems is determined by the rate at which the effluent percolates or filters down through the soil. Effluent will percolate faster in sandy and gravelly soils than in clay soils. Also important to performance is the level of ground water. When the ground water level is high enough to saturate the soil around the drain field, the effluent will not percolate and must remain near the surface of the ground. In these cases there is a possibility of contamination of ground and surface water which can affect wells, streams, ponds, etc.

The problems with on-site sewage disposal in the TMACOG region are twofold. First, the great majority of the area is not suitable for septic tanks due to soil types or high water tables. Second, there is a general lack of consistency in application of controls on installation and follow-up maintenance of septic tank disposal systems.



EXAMPLES OF SEWERLESS TOILETS

Possible Solutions:

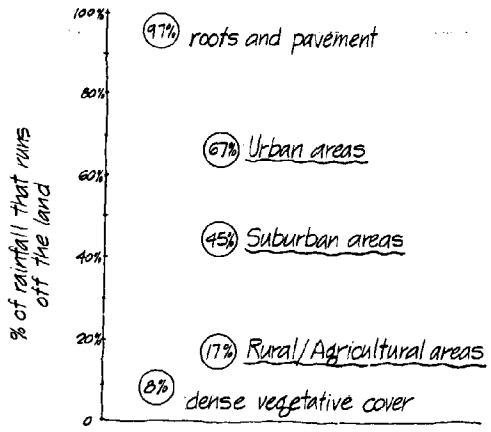
- Establish **sanitary districts for septic tank maintenance** to insure regular pump-outs and provide early identification of system failures. **(L)**
- Amend health and building codes to encourage **sewerless toilets** (see illustration). **(L)**
- Adopt **population density standards** based on soil capabilities and desired growth patterns to limit septic tanks in areas that will not receive sewer services. **(L)**
- Install **water hyacinth lagoons** in areas with failing septic tanks to provide natural purification of waste water. Since water hyacinths are about 20 percent protein, regular harvests could be sold for processing into cattle feed. **(C)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

urban erosion and runoff

Urban storm water runoff is a significant hazard to water quality. In the past, storm water runoff was thought to be simply rainwater. Recent studies have shown that the pollution load of a city's storm runoff can equal the load on its sewage treatment plant.[8]

Current storm drainage systems simply carry water away from the site, taking most of the pollutants deposited on the streets, parking lots, and other hard urban surfaces directly to nearby rivers or streams. The increased runoff caused by paving large areas of urban land also causes stream bank erosion and greater likelihood of downstream flooding. Engineering data indicates that 67% of all rainfall in urban areas is not absorbed. This runoff must be collected and carried away. In comparison, only 17% of rainfall runs off in rural-agricultural areas.[9] The increased runoff in urban areas results in two problems: pollutant loadings and flooding. The resource management concept suggests that solutions which simply carry storm water rapidly away from the site are not appropriate to deal with these two problems.



RUNOFF IS RELATED TO LAND USE

Pollutant Loadings

Pollutant loadings can be minimized in two ways: either by preventing the contamination of runoff, for example, controlling erosion from construction sites or providing street cleaning programs, or by treating the polluted runoff before it enters receiving streams, for example, providing settling basins or holding ponds.

Flooding

Flooding problems can be reduced by preserving the capacity of the environment to absorb rainfall on site, or by developing design standards for new storm drainage systems that will reduce peak flows.

Construction Site Erosion

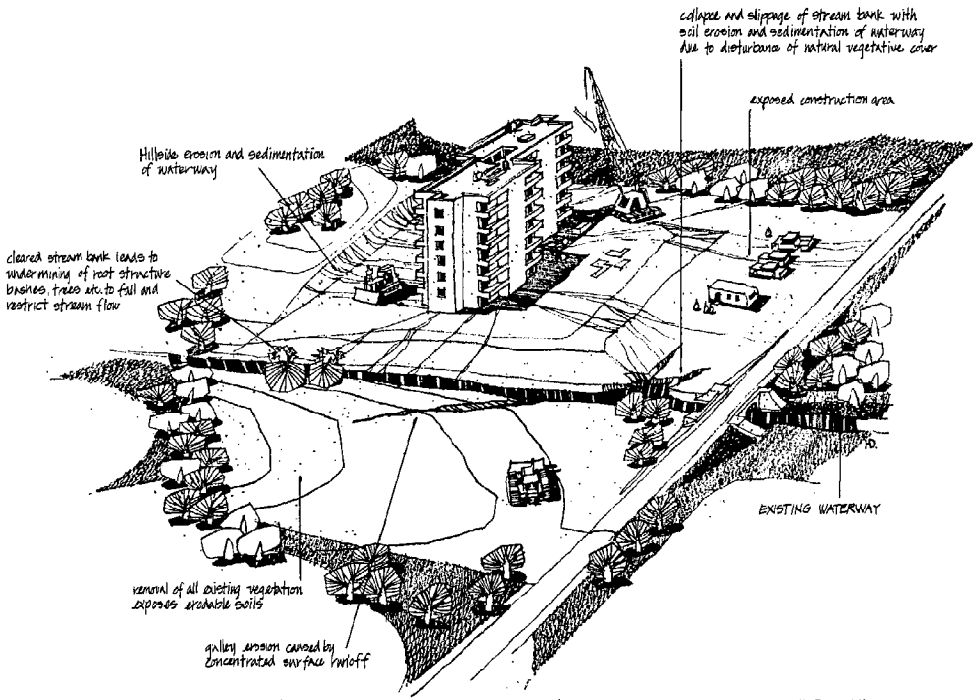
One special aspect of the urban pollutant loading problem relates to erosion from construction sites. Urbanizing land is more subject to erosion than any other category of land. Construction projects lay bare the soil and alter natural slopes and drainageways so extensively and for such long periods of time that the construction site erosion hazard is many times that of land with natural vegetative cover.

Construction site erosion losses over the duration of a project may be as great as 30 tons of soil per acre.[10] This lost soil is ultimately deposited as sediment in ditches, channels, streams, rivers, and harbors. It costs the public approximately $5,000 to remove the sediment generated by a typical 50-acre project.

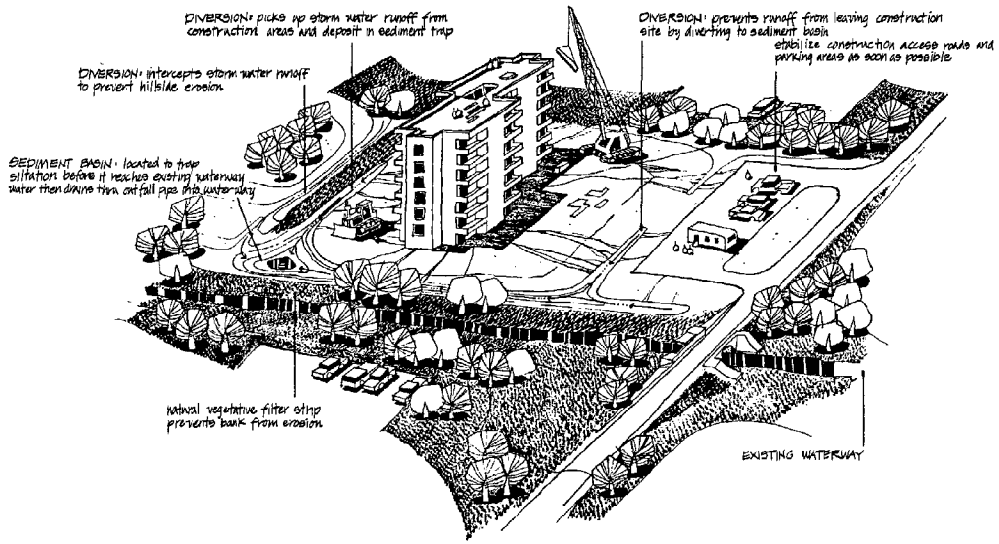
Effective control of construction site erosion involves three basic principles.

1. "Fit" the development plan to the site by utilizing existing topography and vegetation, thus limiting the extent of disturbed area.
2. Retain sediment on site through erosion control measures (see illustration on page 23).
3. Install permanent structural and vegetative erosion control measures as soon as possible in the construction phase.

Note: For further information on erosion control practices, see Beckett Jackson Raeder Inc, *Michigan Soil Erosion and Sedimentation Control Guidebook* (Lansing: Michigan Department of Natural Resources, Water Development Services Division, 1975).



UNPROTECTED CONSTRUCTION AREAS RESULT IN SOIL EROSION AND SEDIMENTATION OF WATERWAYS
(high cost to public and developer)



PROTECTED SITE HELPS REDUCE SOIL EROSION AND SEDIMENTATION
(potential savings to public and developer)

Possible Solutions:

- Adopt **construction site erosion control** ordinances. **(L)**
- Develop a program for regular **street cleaning** to minimize contamination of runoff. **(A)**
- Utilize existing urban open space areas for **temporary storage** of storm water runoff. **(C)**
- Modify building and subdivision regulations to require **on-site storm water management** through roof-top or parking lot retention areas. **(L)**
- Develop a comprehensive **watershed management** program to incorporate items 1 through 4 above into a coordinated systems for the protection of water quality. **(L and A)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

rural soil erosion and land runoff

Rural erosion is caused by the action of raindrops falling on the land. The impact detaches soil particles which are then transported by the water running off the land. As velocity of flow increases, the water detaches more soil particles and begins to cut rills and gullies. When velocity decreases, the soil particles are deposited as sediment. Rural erosion and soil loss are determined by five factors: soil characteristics, topography, rainfall, vegetative cover, and erosion control practices.

Soil Characteristics

Each soil type has a different susceptibility to erosion, determined by its physical composition. In general, soils which contain high proportions of silt and fine sand are most likely to erode. The susceptibility to erosion decreases as clay or organic matter increases.

Topography

The topography affects the volume and velocity of runoff. As slope lengths and gradients increase, the erosion hazard increases due to the concentration of runoff and its tendency to detach and transport soil particles.

Rainfall

The amount of runoff and subsequent erosion potential is determined by the frequency, intensity, and duration of rainfall. Heavy rain storms that occur often and last for a long time produce the greatest erosion hazard.

AGRICULTURAL SOIL EROSION CONTROL PRACTICES

Control Practice	Description	Estimated Cost
Conservation cropping	Growing crops in combination with needed cultural and management measures such as rotations that include grasses and legumes	$1.50/acre
Critical area planting	Stabilizing silt-producing and severely eroded areas by establishing vegetative cover	$400.00/acre
Crop residue management	Using plant residues to protect cultivated fields during critical erosion periods	$1.50/acre
Diversions	Channels constructed across a slope to prevent bank erosion	$.50/foot
Grassed waterways	Sloped or graded waterways established in vegetation	$450.00/acre
Holding ponds	Stuctures or pits for temporary storage of animal or agricultural wastes or associated runoff	$5,600.00/pond
Minimum tillage	Limiting the number of plowing operations to only those that are properly timed and essential to produce a crop	$6.50/acre
Streambank protection	Stabilizing and protecting banks of streams against scour and erosion by use of vegetation or structures	$2.00/foot
Tile drains	Tile or pipe installed beneath the ground surface which collects or conveys drainage water	$.40/foot

Source: Table adapted from *Environmental Impact of Land Use on Water Quality: Planning Phase Work Plan*, report no. EPA-G005103 (Chicago: Great Lakes Region United States Environmental Protection Agency, 1974), p. A-46.

Vegetative Cover

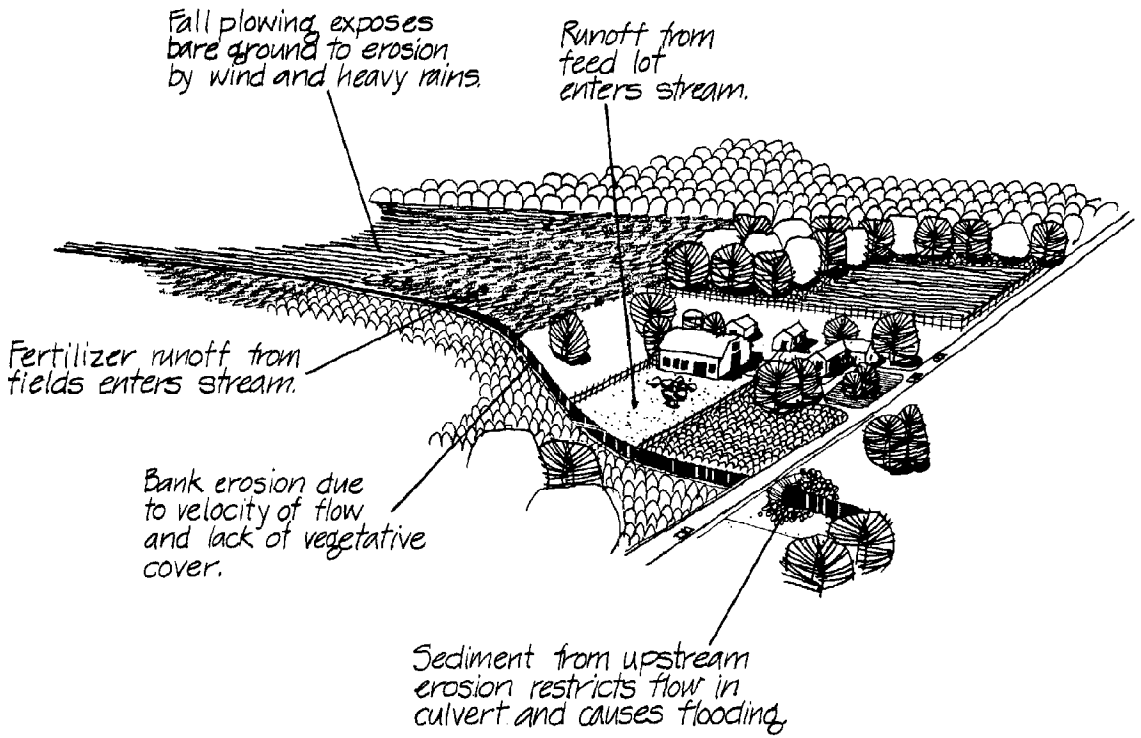
Crop management determines the amount, type, and duration of vegetative cover in agricultural areas. Vegetative cover reduces erosion hazards by shielding bare soil from impact of raindrops, slowing the velocity of the runoff, and holding the soil particles in place with its root systems. The time of tillage and crop residue which is left on the surface of the soil after crop harvesting are important crop management factors. Fall plowing, for instance, results in a bare, unprotected soil surface for up to nine months of the year. Regular mechanical cultivation for weed control buries residue and increases the erosion hazard.

Erosion Control Practices

Some argicultural soil erosion control practices that are applicable to the TMACOG region are listed in the chart along with estimated costs of installation. The chart is one result of a study currently underway in Allen County in Indiana to evaluate land treatment practices which may reduce agricultural soil erosion in the Black Creek watershed, a part of the Maumee River basin.

Region-wide Drainage and Channelization

The prevention of erosion on areas under tillage is and should be the responsibility of the individual farmer. However, his erosion control practices affect the larger region through sedimentation which, in turn, affects the collective population of the TMACOG region. Individual agricultural practices have an impact on the efficiency of the ditches and streams which provide an integrated drainage network for the area. It is this network that has made agricultural use in the region possible. A 1972 study by the Ohio State University Cooperative Extension Service indicates that approximately one-half of the drainage network in Ohio needs improvements to increase the flow capacity and to decrease the hazard of flooding which impairs agricultural production in low areas.[11] The cost of these improvements is estimated to be approximately $31.9 million.[12] The need for improvements is due in part to agricultural practices which have allowed extensive erosion and sedimentation of the system.



RURAL EROSION AND RUNOFF HAZARDS

There is a basic dilemma in that the ineffective drainage system causes flooding which decreases agricultural production and, yet, improvement of the system will increase stream flow and flood risk in downstream areas.

Nutrient Runoff

Agricultural land also can contribute nutrients to the streams and drainage network. Two major sources are runoff from feed lots containing animal wastes and runoff from fields containing commercial fertilizers or pesticides and herbicides. Additional nutrients promote the growth of algae and plankton causing a degradation of water quality both in the streams and in Lake Erie. Pesticides and herbicides are a risk to man's use of the water and also destroy beneficial aquatic organisms. The best approach to reducing fertilizer and pesticide or herbicide runoff from fields is through control of erosion and sedimentation.

Possible Solutions:

- Develop an **education and technical assistance** program to provide aid to farmers in implementing individual pollution abatement measures. **(E and A)**
- Provide incentives through **cost sharing** to encourage installation of pollution abatement practices. **(A)**
- Require participation by individual farmers in a cost sharing **pollution abatement program** through state or local legislation. **(L and A)**
- **Regulate farming practices. (L)**

Note: See page 26 for a discussion of the code letters following each suggested solution.

evaluating possible solutions

The information provided in this book can only suggest a start on the process of evaluating water quality problems. In order to adequately perform this evaluation, several additional needs emerge. First, we need more specific information about the region's water quality problems and an analysis of the causes of these problems. Second, we need much more information about the "possible solutions" presented here. How do they work? Would they work in this region? Have they been successful elsewhere? Are there other solutions not explored here that have merit? Finally, and perhaps most importantly, we need from citizens and officials in the region their evaluation of each solution in light of the importance of the problems it is intended to solve.

All of these needs go well beyond the scope of this brief book. But we can begin to place the solutions to problems into some general perspective and make a start on a meaningful evaluation. Each of the "possible solutions" seems to fit into one or two of four basic categories. These categories are 1) educational (E), the solution calls for a program to inform or educate; 2) legislative (L), the solution calls for new or amended local or state ordinances or legislation; 3) agency cooperation (A), the solution calls for an agency or unit of government to develop and carry out a special program often in cooperation with other agencies or units of government; and 4) public construction (C), the solution calls for public expenditure for some capital construction. The chart below illustrates that some of the problem areas lend themselves to particular categories of solutions. In order to address all water quality problems, we will have to consider all categories of solutions.

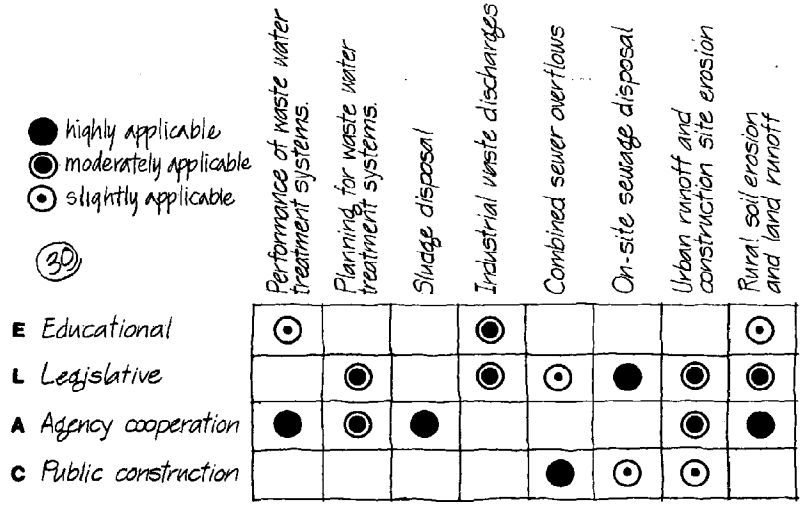


Photo Courtesy of Art Weber, Metropolitan Park District, Toledo

criteria

How do we decide how good a particular solution is? The prime concerns of the 208 Program suggest four criteria that may be valuable in evaluating solutions.

Water quality improvement: Will the solution actually improve water quality?

Cost effectiveness: Will the solution solve the problem at a cost that is reasonable, when all the social, economic, and environmental effects are taken into account?

Public accountability: Would the agency or unit of government needed to implement the solution be accountable to local citizens and elected officials?

Implementation: Is the solution feasible and practical for this region?

Any proposed solution should be weighed against each of these criteria to determine its suitability.

Citizen Attitudes on Approaches to Solving the Problem

Increased federal spending on water quality	46.1%
Increased local spending	50.0%
Increased water and sewer rates	25.3%
Higher consumer costs	11.2%
More federal regulations	20.6%
More local regulation of growth and development	65.8%
More local regulation of land use	71.2%
Lower standards for water quality	4.7%

Source: Adapted from ABT Associates, Inc., "Preliminary Results of TMACOG Phase I Water Quality Survey," unpublished paper, October, 1975.

evaluation and the 208 program

It is clear from the chart describing the 208 Program that broad community involvement in developing the water quality plan is critical. Solutions without community and local government support will not be implemented.

The environmental management concept described on page 11 calls for us to deal with the causes of pollution in a systematic way. Understanding and correcting the situations that cause pollution problems will require some basic reforms in the way we use our resources. This understanding and change can only occur in the context of the balanced system of private enterprise, government, and the public described in *Book 1*. The required support can only be achieved through an open planning process where the problems and proposed solutions can be scrutinized by citizens and local policy makers.

There are no predetermined solutions to the complex problems described in this book. The TMACOG 208 Program can be as valuable to us as we choose to make it. More federal red tape? Threat to local autonomy? Rather, it is an opportunity for local governments to work cooperatively to solve problems and implement solutions based on recognition of local needs and capabilities. The choice is ours.

The 208 Planning Process

The Federal Water Pollution Control Act Amendments of 1972 established the following process for water quality planning.

Step 1: TMACOG was designated by the state on the basis of local government resolutions indicating intent to develop and implement an area-wide plan. This provided a focal point in the region for water quality planning and management.

Step 2: TMACOG will develop an initial area-wide plan to address all water quality problems in the region and to indicate how (by what agency) the plan will be carried out.

Step 3: Local governments in the TMACOG region will concur in the plan and the recommendation of a local agency(s) to implement the plan.

Step 4: Upon U.S. EPA approval of the plan and agency(s), that agency will be the only eligible recipient of EPA construction grants for sewage treatment facilities in the region.

what you can do

Input from an informed public is an important part of the definition and selection of courses of action to solve water quality problems.

In *Book 1* we discussed the problems that confront us. The forums and survey that followed, resulted in valuable input from citizens about the nature and relative importance of these problems. In this book, based on that input, we have made some very general suggestions about how water quality problems might be solved.

At this point, we need you to give us direction. What kinds of solutions are most appropriate for this region?

- **Attend one of TMACOG's public forums** in your area to help define solutions to water quality problems more precisely.
- **Communicate your concerns about water quality to local officials in your community** who are working with the TMACOG water quality program. Call TMACOG to learn the names of the officials nearest you who are members of the Water Quality Policy Advisory Committee.
- **Ask us to come to a meeting of your club or organization** and explain the program as it relates to you. Call TMACOG to make arrangements.

Our telephone number is (419) 241-9155.

NOTES

[1] *Lake Erie Water Quality Newsletter,* no. 5 (Buffalo, N.Y.: Lake Erie Study Buffalo District Corps of Engineers, October, 1975), pp. 1-2.

[2] Citizen Opinion Survey, conducted by the Toledo Metropolitan Area Council of Governments in cooperation with Ohio Department of Economic and Community Development, September, 1975.

[3] United States Environmental Protection Agency, *Decision-Makers Guide in Solid Waste Management* (Washington, D.C.: United States Government Printing Office, 1974), p.128.

[4] Ohio Environmental Protection Agency, "OEPA Environmental Facts," n.d.

[5] William I. Goodman and Eric C. Freund, (eds.), *Principles and Practice of Urban Planning* (Washington, D.C.: International City Managers' Association, 1968), p. 235.

[6] George W. Carey et al., *Urbanization, Water Pollution, and Public Policy* (New Brunswick, N.J.: Center for Urban Policy Research, Rutgers University, April, 1972), p. 145.

[7] United States Department of Health, Education, and Welfare, *Manual of Septic-Tank Practice,* rev. ed. (Washington, D.C.: United States Government Printing Office, 1967), p. v.

[8] Anthony N. Tafuri, "Pollution from Urban Land Runoff," in *News of Environmental Research in Cincinnati* (Cincinnati: United States Environmental Protection Agency National Environmental Research Center, April 11, 1975).

[9] Adapted from Elwyne E. Seelye, *Design: Data Book for Civil Engineers* (New York: John Wiley and Sons, Inc., 1960), p. 18-02.

[10] Michigan State University Agricultural Experiment Station, *Soil Erosion in an Urbanizing Watershed,* Natural Resources Research Report no. 133 (East Lansing, Mi.: Michigan State University, March, 1971).

[11] *Storm Drainage Guidance Manual* (Toledo: Toledo Metropolitan Area Council of Governments, 1974), p. 11.

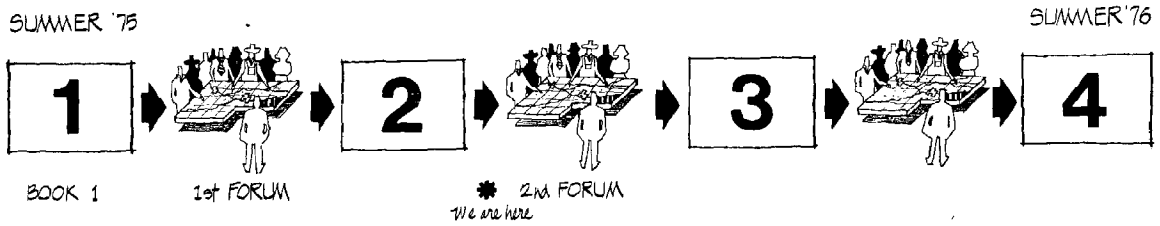
[12] Ibid., p. 13.

public involvement and the tmacog water quality program

This book is the second of a series dealing with water quality in the TMACOG region. The series of books is designed to provide information and to stimulate public involvement, but it is also a part of a larger program.

Each book sets the theme for the program of two to four public forums to be held in different locations in the region. These forums are open to the general public and aim at providing an opportunity for individual citizens to discuss water quality issues with community leaders and TMACOG water quality staff members. Each forum will be concluded with a survey of the opinions of the forum participants.

The subject matter of the forums will generally follow the sequence of the planning process, first focusing on issues, then formulating and discussing alternatives to solving identified problems, and, finally, selecting a water quality plan and implementation program for the plan.



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